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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

# Dead Trees Used by Cavity-Nesting Birds on the Fraser Experimental Forest: A Case History

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A total of 1,722 lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) snags were surveyed for cavity-nesting bird use on the Fraser Experimental Forest in Colorado. Broken-top snags greater than 12 inches d.b.h. had the highest percentage of bird use. Holes were also found in live trees with broken tops and scars. It is recommended that all broken-top snags greater than 8 inches d.b.h. be left standing for snag dependent wildlife and that live trees with broken tops or scars be left standing during timber harvest to insure future sites for cavity-nesting birds.

Dead trees (snags) serve a variety of purposes in natural timber stands. Many hole-nesting birds and mammals nest in snags, and ospreys (*Pandion haliaetus*) generally use snags for nesting structures. Snags are favorite perches for band-tailed pigeons (*Columba fasciata*), and are useful to raptors and fly-catching birds for hunting, feeding, and roosting perches. Red squirrels (*Tamiasciurus hudsonicus*) and some birds store food in snags, and woodpeckers feed on insect larvae in trunks of dead trees. Although the number of cavity-nesting birds in the subalpine zone may be lower than in some other timber types, they make up about 25% of the avian population.

In 1977, the U.S. Forest Service adopted a snag management policy to provide habitat needed to maintain viable, self-sustaining populations of cavity-nesting and snag-dependent wildlife species on the National Forests (U.S. Department Agriculture 1977). Recent emphasis on utilization of logging slash and standing dead trees for wood fiber (Bergstrom 1977, Wahlgren et al. 1977) may conflict with snag management goals. Since not all snags are suitable for both wildlife nesting sites and wood fiber, some trade-offs are possible. In addition, foresters need to know what kind of snags are used by wildlife and what trees will become snags suitable for wildlife.

Published information that will assist foresters in snag management is lacking. Scott et al. (1977) listed cavity-nesting birds of North America and summarized available information on distribution, food habits, and nest site requirements. McClelland and Frissell (1975)

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described characteristics of snags used by birds in western larch (*Larix occidentalis*) and Douglas-fir (*Pseudotsuga menziesii*) forests in Montana. Scott (1978) described ponderosa pine (*Pinus ponderosa*) snags used by birds in Arizona, but research is needed in other timber types and at other geographic locations because decay and standing time of snags will differ with climatic conditions.

## METHODS

This study was conducted on the Fraser Experimental Forest, Colo. The forest has been described in detail by Alexander and Watkins (1977). Most snags inventoried were on study plots established to determine responses of nongame birds and small mammals to timber harvests. Additional spruce and fir snags were sampled outside the study plots. Plots were at approximately 10,000 feet elevation. Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) were the dominant overstory species in valleys and on north-facing slopes, while lodgepole pine (*Pinus contorta*) dominated southern exposures and ridges.

To characterize snags used by cavity-nesting birds, information was gathered on 1,078 lodgepole pine snags, 230 spruce snags, and 421 fir snags in the subalpine zone on the Fraser Experimental Forest.<sup>3</sup>

Information collected on snags 4 inches d.b.h. and larger included: d.b.h., condition of top (broken, etc.), relative size of branches, percent of bark present, condition of whitewood (solid or rotten), aspect, percent slope, and number of cavities. Each snag was examined with binoculars to determine bird use. Only those cavities that appeared to be true nest holes were counted. Snags with cone-shaped cavities or "starts" were not recorded as used.

## RESULTS

### Cavity-Nesting Birds Observed on the Study Area

Cavity-nesting birds observed on the study area during the breeding season included:

<sup>3</sup>The authors wish to acknowledge the efforts and assistance of Peggy Svoboda and Steve Martin in collecting the data for this paper.

mountain chickadee (*Parus gambeli*), western flycatcher (*Empidonax difficilis*), Williamson's sapsucker (*Sphyrapicus thyroideus*), common flicker (*Colaptes auratus*), red-bellied nuthatch (*Sitta canadensis*), hairy woodpecker (*Picoides villosus*), brown creeper (*Certhia familiaris*), and black-capped chickadee (*Parus atricapillus*).

The cavity-nesting bird population was relatively low (48 pairs per 100 acres). There were 44 snags and 10 live trees per 100 acres indicating bird use. Most snags and live trees used were poor quality timber that could be left standing during harvesting with little loss of timber volume.

### Characteristics of Snags With Nest Holes

#### Diameter at Breast Height

**Lodgepole pine.**—Eighty-six percent of the lodgepole pine snags were less than 12 inches in diameter (table 1), but fewer than 1% showed evidence of use by cavity-nesting birds. The smallest snag found with a nesting hole was 6.5 inches in diameter. Eight percent of the snags greater than 11 inches d.b.h. had been used by cavity-nesting birds.

**Subalpine fir.**—Eighty-four percent of the fir snags were also less than 12 inches in diameter, and only 1% of these were used by cavity nesters. The smallest fir snag with a cavity was 10.2 inches d.b.h. In the larger diameter classes, 8% of the snags were used; the 16- to 19- and 20- to 23-inch classes had the highest use.

**Spruce.**—Forty-four percent of the spruce snags were in the 4- to 11-inch diameter classes, but only 2% were used by cavity-nesting birds. The smallest spruce snag found containing a nest hole had a diameter of 10.3 inches. Eighteen percent of the snags in classes larger than 11 inches d.b.h. contained cavities.

#### Broken Tops

**Lodgepole pine.**—Lodgepole pine snags with broken tops (fig. 1) were used more than those with intact tops (fig. 2). According to McClelland et al. (1975), the broken tops provide an avenue of entry for heart rot fungi (*Fomes* spp.), and development of heart rot was necessary to provide suitable nest sites for primary cavity nesters in live, broken-top larch

Table 1.—Snag density and bird use of snags with broken and intact tops by size class

Species	Size class				Total	Density per acre
	Broken		Intact			
	4-11	12+	4-11	12+		
--- Inches d.b.h.---						Number
Lodgepole pine						
With holes	4	9	4	3	20	0.16
Total	93	21	837	127	1,078	12.60
Percent	4.3	42.9	0.5	2.4	1.9	
Subalpine fir						
With holes	4	5	0	0	9	0.04
Total	56	24	299	42	421	3.50
Percent	7.1	20.8	0.0	0.0	2.1	
Spruce						
With holes	1	15	1	7	24	0.22
Total	25	41	75	81	223	3.50
Percent	4.0	36.6	1.3	8.6	10.8	
Total						
With holes	9	29	5	10	53	0.42
Total	174	87	1,211	250	1,722	17.70
Percent	5.2	33.3	0.4	4.0	3.1	



Figure 1.—Snags larger than 8 inches d.b.h. with tops broken off were usually selected as nest sites.

trees in Montana. Heart rot apparently is important in snags, since 9 to 21 broken-top snags larger than 11 inches d.b.h. had been used by cavity-nesting birds (table 1).

**Subalpine fir.**—All fir snags used by birds had broken tops, but those larger than 19 inches d.b.h. were used most often.

**Spruce.**—Spruce snags with broken tops were used more often than those with intact tops, and those greater than 11 inches d.b.h. showed the most use.

### Other Characteristics

Bark retention, tree height, aspect, and branch condition were examined for all snags, but there were no differences in use based on these characteristics.

### Live Trees Used

Nest holes were recorded in eight live lodgepole pine and two live spruce trees. With one exception, these nest holes were located in dead tops or in scars (fig. 3). One nest was found in the live wood of a broken-top lodgepole pine tree. Live trees used for cavity nests ranged from 9 to 20 inches d.b.h. and averaged 14.4 inches.



## SUMMARY AND MANAGEMENT IMPLICATIONS

Cavity-nesting birds on the Fraser Experimental Forest used few of the available snags and live trees as nest sites. Those selected were usually larger than 8 inches d.b.h. and had broken tops. No other characteristics examined seemed to be important in nest site selection.

Scott (1978) found about 30% of the snags were lost during timber harvest in a ponderosa pine forest, and suggested that all snags be left standing except those that were safety hazards. In subalpine forests where snag density is high (17.7 per acre), all but one or two suitable snags per acre could be harvested without detriment to the cavity-nesting birds or raptors. Since some snags will be lost because of winds after timber harvest, all snags over 8 inches d.b.h. with broken tops should be left standing. Live trees with broken tops or scars should be left to provide future snags.

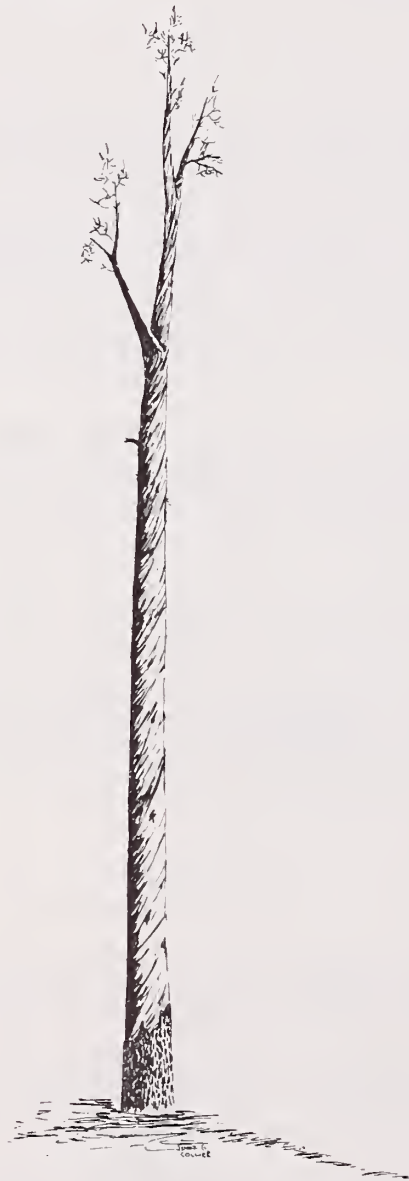


Figure 2.—Hard snags with intact tops were used significantly less than broken-top snags.

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Figure 3.—Live trees with scars or broken tops also provided nest sites for cavity-nesting birds and can provide a source of future snags.